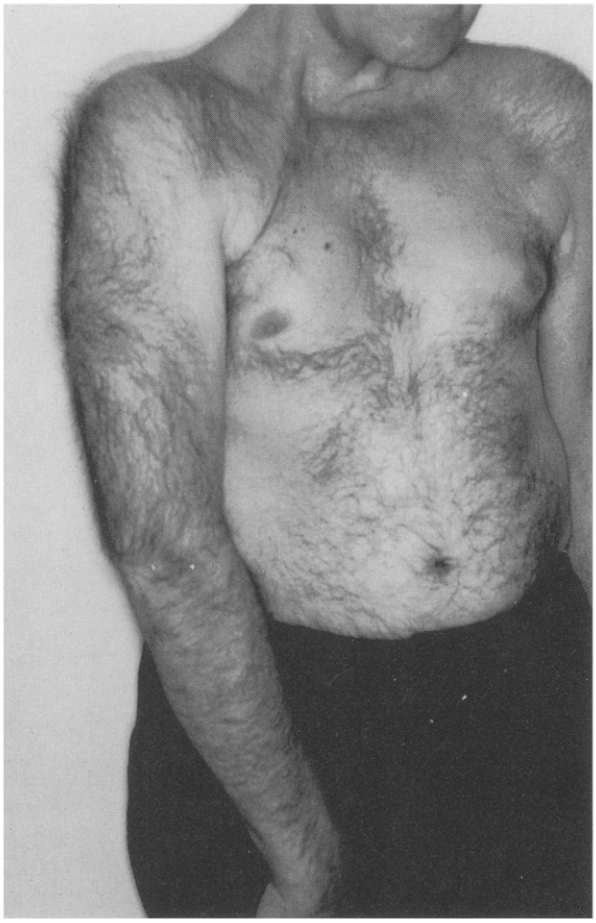

Fig. 1. This patient was submitted to anterior transclavicular approach. The median half of the clavicle was removed and the sternomastoid muscle divided, as was the clavicular part of the major pectoralis muscle. The shoulder deformity is evident, and this caused an important deficit and patient discomfort.

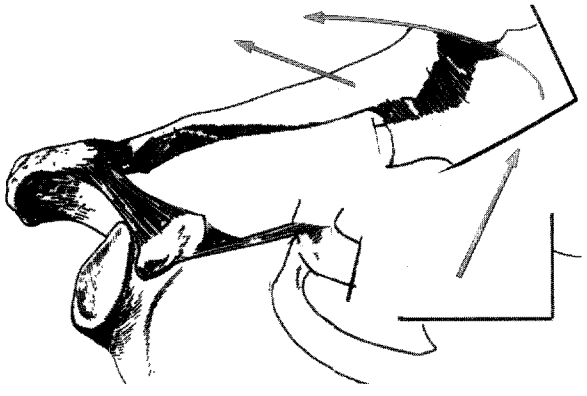

Fig. 2. Transmanubrial L-shaped incision and section of the first cartilage.

tinal lymph node dissection, is necessary. The access proposed by Nazari, pulling the clavicle downward, seems too limited for these procedures.

The transmanubrial approach that we[2] described recently, which spares entirely the osteomuscular components of the cervical and shoulder articulations (Fig. 2), affords an excellent exposure to the thoracic inlet and mediastinal great vessels. This approach, respecting the muscular attachments to the clavicle, progressively elevates an osteomuscular flap and even allows a regular lobectomy to be performed with lymph node dissection, provided that one is familiar with the anterior approach to the pulmonary hilum. Reposition and fixation of the manubrial "edge" is very easy and retains the clavicular mobility.

This technique, addressing the same objective as Nazari's, seems to us even less harmful and permits an even better access to this complex area.

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12/8/79873

Endorsement for sparing the clavicle in the transcervical approach to the thoracic inlet

To the Editor:

We read with interest the exchange of letters between Nazari[1] and Dartevelle and Macchiarini[2] in the August issue of the Journal. We also have changed our surgical technique to the anterior transcervical approach for oncologic resections of the thoracic inlet and apex of the lung. We agree that this approach allows excellent exposure of the cervical expansions of the neoplasm, as well as better removal of the supraclavicular lymph nodes. Visualization of the trunks of the brachial plexus and control of the subclavian vessels is also easier through this approach.

We are grateful to Nazari for reminding us of the advantages of sparing the clavicle. We applied his technique to our next case, using the anterior transcervical approach to the thoracic inlet. The patient was a 36-year-old male truck driver with a neurofibroma extending along the anterior surface of the T-1 to T-4 vertebral bodies. He had pain in the left side of the chest, arm pain, and numbness. Some specifics of the technique we used in preserving the clavicle are described here.

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Cardiovascular Surgery
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The sternocleidomastoid muscle and the pectoralis major muscles were separated from the clavicle, leaving an approximately 1 cm margin on the clavicular side. The omohyoid fascia was dissected from the undersurface of the bone. The clavicle was disarticulated from its medial points of connection with the sternum and with the first rib with a sharp chisel through the joint capsule, leaving the intraarticular disc of the sternoclavicular joint with the clavicular head. As pointed out by Nazari, the clavicle rotated easily, swinging in a downward direction and completely out of the surgical field. We did not find that the field was compromised by the preservation of the clavicle, which Dartevelle claimed would occur. Access to the tumor itself, as well as control of the neurovascular structures, was not impinged. After resection of the tumor, the clavicle was rotated upward and the sternoclavicular joint was reconstructed with a sternal wire through the clavicular head and the manubrium in such a manner that the braid of the wire lay along the deep surface of the clavicle. This reconstruction allowed 45 degrees' elevation and 5 degrees' depression of the clavicle, as well as some rotation, but limited the normal 15 degrees of protrusion and retraction.[3] The pectoralis major and sternocleidomastoid muscles were then reattached to the clavicle along the 1 cm margin of muscle tissue remaining. In our case, we chose to disarticulate the clavicle from the sternum and first rib. An alternative approach, pointed out by Dartevelle, would have been to split the manubrium to preserve the sternoclavicular joint. The possible advantage of this method was demonstrated by Bearn,[4] who showed that the sternoclavicular capsule plays the major role in stabilizing the joint and provides a "locking mechanism" preventing further downward displacement of the lateral end of the clavicle at rest.

The cosmetic and functional results for this most recent patient were unquestionably better than in our previous experience of resecting the medial third of the clavicle. On the morning of the first postoperative day, the patient was able to abduct and adduct his arm, as well as adequately flex and extend his shoulder. The clavicle was stable, with good rotational motion at its junction with the manubrium during these maneuvers. This is in sharp contrast to a 43-year-old patient who had a renal cell metastasis of the thoracic inlet removed through a transcervical approach with resection of the medial half of the clavicle 1 month previously. This patient has had a much slower recovery with persistent limitation of shoulder flexion and extension almost 2 months after resection. The decreased range of motion of the affected shoulder prevents him from lifting a full glass of water off the table and limits his activities with the ipsilateral hand in daily living. The cosmetic result in this patient was good, but clearly less satisfactory than the result provided by the clavicle-sparing technique.

Although numerous reports have shown that partial or total claviculectomy yields "good" functional results and "satisfactory" cosmesis, routine claviculectomy should be regarded with skepticism. Anatomic studies have identified several important functions of the clavicle: It is a strut supporting the glenohumeral joint and produces a circular range of motion, it increases the power of the arm-trunk mechanism, it supports the level of the lateral clavicle in the resting position, and it provides protection for the major nerves and vessels entering the arm.[3-5] Furthermore, the long-term cosmetic and functional result of the ipsilateral shoulder is compromised because the shoulder tends to fall downward, forward, and medial under the weight of the arm, giving a foreshortened appearance to this area. This is not a trivial consideration in the treatment of young patients with a normal life expectancy and a nonmalignant disease.

We are grateful to Dartevelle for his description of the surgical approach to the thoracic inlet, which has altered our approach to both malignant and benign tumors of this region. However, we disagree with his premise that the risk of pseudoarthrosis after clavicular osteosynthesis militates against the preservation of the clavicle. Moreover, we do not think that preservation of the clavicle compromises surgical exposure of the thoracic inlet. We share Nazari's enthusiasm for clavicular preservation with the Dartevelle transcervical approach to the thoracic inlet and believe that further follow-up and application of this technique are warranted.

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12/8/79874

Reply to the Editor:

We read with interest the letters of Grunenwald and associates and Jaklitsh and Rego on the convenience of sparing the clavicle during the transcervical approach to the thoracic inlet and are pleased to reply. Our early experience with this operation began in 1980, and since then more than 90 patients have undergone resection for either bronchogenic tumors or other benign or malignant neoplasms invading the thoracic inlet. Several lessons have been learned and a brief review of them seems appropriate.

1. The horizontal part of the L-shaped incision starts about 2 cm below the clavicle and extends into the deltopectoral groove. This widens the operating field and permits the complete en bloc resection (including the performance of the upper lobectomy) through this approach alone without resorting to an additional thoracotomy. The resulting functional and esthetic benefits are evident.

2. Great care is paid to avoid injury to the long thoracic